

General Description

The MAX20733 Evaluation Kit (EV kit) serves as a reference platform for evaluating the MAX20733 voltage regulator IC. This single-chip, integrated switching regulator provides an extremely compact, low-cost, highly efficient, fast, accurate and reliable power delivery solution for emerging low-output voltage applications up to 35A. Refer to the MAX20733 IC data sheet for more information.

The EV kit consists of a fully assembled and tested PCB implementation of the MAX20733. Jumper pins, test points, and input/output connectors are included for flexibility and ease-of-use in a wide range of applications.

The evaluation board is configured with an “edge strip” to allow high di/dt loading when evaluating the system. The +V_{OUT} connection is on the top side, while the return (or -V_{OUT}) is on the bottom side, directly mirroring the top-side strip.

Either solder directly to the output “strip” or use the J8 terminal block to interface to a load.

Features

- High Efficiency and Power Density
- Low Component Count
- Small Solution Size
 - 509mm² Including Inductor and Output Capacitors
- Optimized Performance
- Reduced Design-In Time
- Proven PCB Layout
- Fully Assembled and Tested

Getting Started

Required Equipment

- MAX20733 EV kit
- 4.5V to 16V power supply
- 0A to 35A Load
- Oscilloscope, probes, voltmeter

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation:

- 1) Connect a powered-off 4.5V to 16V input supply to J1.
 - Optionally, connect supply sense leads to V_{DD1} and GND1 for best accuracy.
- 2) Connect the load to J3 or J8.
- 3) Connect the V_{OUT} scope probe/voltmeter to J4 or J11, as desired.
 - J4 and J11 are connected to the sense point for best accuracy.
- 4) Position the SW1 toggle switch, pointing away from J1 to enable the IC (if desired).
- 5) Turn on the power supply and observe that V_{OUT} = 1V.
- 6) For efficiency measurements, J6 has appropriate Kelvin sense points.

Ordering Information appears at end of data sheet.

Operation

The MAX20733 IC is a monolithic, high-frequency step-down switching regulator optimized for applications requiring small-size, high-efficiency, and low-output voltages. Detailed product and application information is provided in the MAX20733 IC data sheet.

Output Enable (OE)

OE is used to enable/disable the output voltage. The output voltage is enabled/disabled by SW1. Pointing SW1 in the direction of the silkscreened arrow enables the regulator.

Output-Voltage Selection

The EV kit is setup to initially boot up to an output voltage of 1V. This has been accomplished by setting the reference to come up to a V_{BOOT} of 0.6484V and placing a voltage-divider in the feedback path with a divide ratio of 0.6484. For different V_{OUT} values, the V_{BOOT} and feedback-divider ratio can be changed, as described in the MAX20733 IC data sheet.

R_{GAIN} and C_{OUT} can also be changed to affect performance. Refer to the MAX20733 IC data sheet for more details.

Soft-Start and Switching Frequency

These are programmable parameters. For the EV kit, soft-start is set to 3ms, and switching frequency to 400kHz.

Status Monitoring

Whenever the part is actively regulating, and the output voltage is within the power-good window, the STAT pin is high. In all other conditions, including enabled but in a fault state, the STAT pin is pulled low. Refer to the MAX20733 IC data sheet for more details.

Input-Voltage Monitoring

The V_{DD1} and GND1 sense points monitor the input supply.

Switching-Voltage Monitoring

The switching waveform can be monitored on VX1.

Output-Voltage Monitoring

J4-1 and J4-2 monitor the output voltage of V_{OUT} and GND, respectively. These test points should not be used for loading. Alternatively, scopejack J11 can be used to monitor the output voltage.

Efficiency Testing

J6 provides convenient access to the appropriate V_{IN} and V_{OUT} sense points.

- $V_{IN_EFF\pm}$ are on J6 pins 1 and 2.
- $V_{OUT_EFF\pm}$ are on J6 pins 3 and 4.
- Input and output currents should be measured with 0.1% lab shunts.
- For increased accuracy, shunt mismatch can be measured and calibrated out by doing a test running the same current through both shunts.

Ordering Information

DEVICE TYPE	TYPE
MAX20733EVKIT#	EV Kit

#Denotes RoHS compliant.

MAX20733 BOM

Part Reference	Quantity	Description
C 1, C 74, C 75	3	100uF, 25V, 20%, TANTALUM
C 24	1	0.01uF, 25V, 10%, X7R
C 28, C 29	2	470uF, 6.3, 20%, S P-CAP
C 3	1	0.1uF, 25V, 10%, X7R
C 32	1	1000pF, 50V, 10%, X7R
C 5, C 6, C 10, C 11	4	47uF, 25V, 20%, X5R
C 60, C 61	2	1.0uF, 25V, 20%, X5R
C 64, C 65, C 67, C 71, C 76, C 77	6	100uf, 6.3V, 20%, X5R
C 7	1	1uF, 25V, 10%, X7R
C 8	1	0.22uF, 16V, 10%, X7R
C 9, C 36, C 51	3	10uF, 6.3V, 20%, X5R
GND1, GND2, GND3, LOOP, VDD1, VX1	6	1_PIN-1X1 Straight
J 1, J 8	2	2_PIN-2 Pin, Terminal Block w/Screws, Blue
J 11	1	Shielded Scope Probe Jack, Vertical
J 3	1	2_Pin-Edge Fingers
J 4	1	VOUT-DIF-1X2 Straight
J 6	1	8_PIN-2X4 Straight
J 7	1	6_PIN-2X3 Straight
L 1	1	170nH, 10%, Isat= 66A
R 1	1	1.78K Ω , 1%, 1/16W
R 10, R 20, R 21, R 22, R 23	5	1K Ω , 5%, 1/16W
R 11, R 14	2	0 Ω , 5%, 1/16W
R 2	1	162K Ω , 1%, 1/16W
R 3	1	2.67K Ω , 1%, 1/16W
R 4	1	10 Ω , 1%, 1/16W
R 5, R 8	2	20K Ω , 5%, 1/16W
R 6	1	1.87K Ω , 1%, 1/16W
R 9	1	3.48K Ω , 1%, 1/16W
SW 1	1	DPDT-DPDT, 6pins, 1 switch
U 1	1	MAX20733
	1	PCB# 35-900356-01-00

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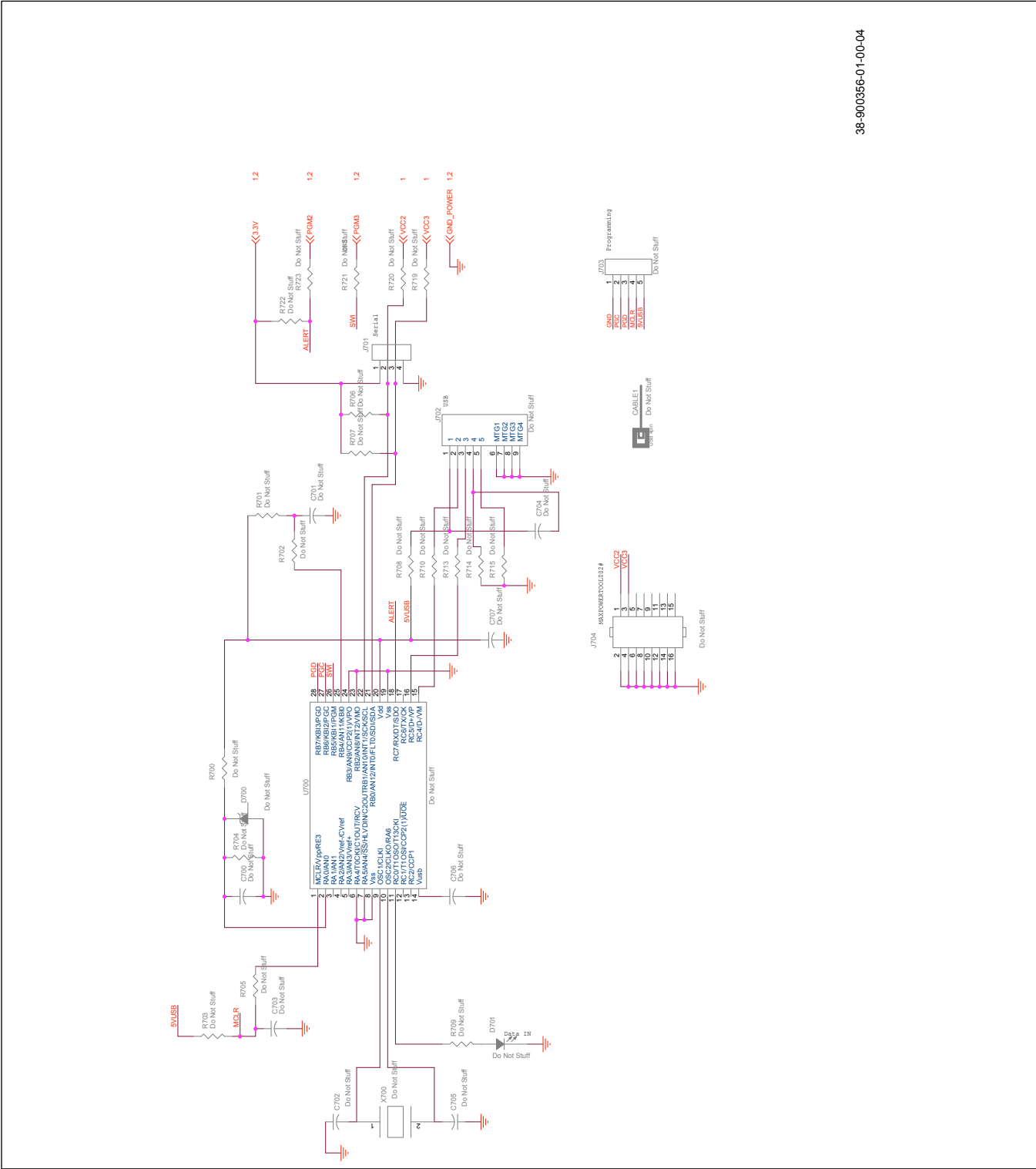


The schematic diagram illustrates a boost converter circuit. The input section includes a VDDH supply connected through resistor R20 (1K) to node VIN_EFF+. A bypass capacitor C20 (0.01F, 25V, XSR) is connected between VIN_EFF+ and VIN_EFF-. The output section features a load resistor R21 (1K) connected from VIN_EFF- to ground, and another load resistor R22 (1K) connected from VOUT_EFF+ to VOUT. A compensation network consisting of capacitors C21 (0.01F, 25V, XSR) and C22 (0.01F, 25V, XSR) is connected between VOUT_EFF+ and VOUT.

The main power stage consists of a MOSFET M1 (IRLML6402) driven by a gate driver U1 (U1P282/ANALOG 3.3V). The gate driver's ON/OFF pin is connected to SW13, its BYPASS pin to GND, and its STAT pin to the gate of M1. The drain of M1 is connected to VOUT through a sense resistor R23 (1K). The source of M1 is connected to the negative terminal of an inductor L1 (C56, 10µH, 25V, XSR) and to the positive terminal of a diode D1 (XSR0402). The other end of the inductor L1 is connected to the positive terminal of the output capacitor C55 (0.003F, 25V, XSR) and to the negative terminal of the diode D1. The negative terminal of the output capacitor C55 is connected to ground.

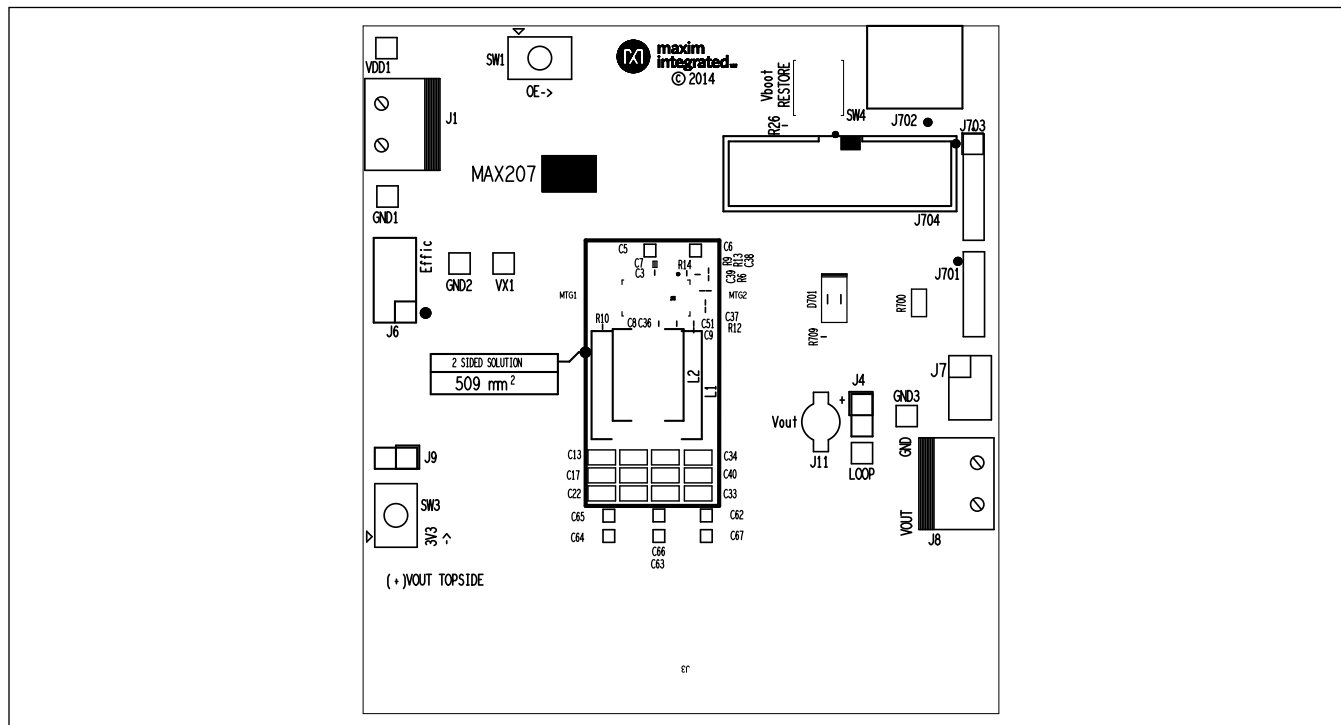
The feedback network includes a voltage divider formed by resistors R24 (1K) and R25 (1K), which samples the output voltage VOUT and feeds it back to the FB pin of the gate driver U1. The gate driver also has an EN pin connected to SW14 and a CS pin connected to GND. The SW13 and SW14 pins are controlled by external signals VDDPH and VDDM, respectively, through pull-up resistors R26 (1K) and R27 (1K).

MAX20733 Schematics (continued)

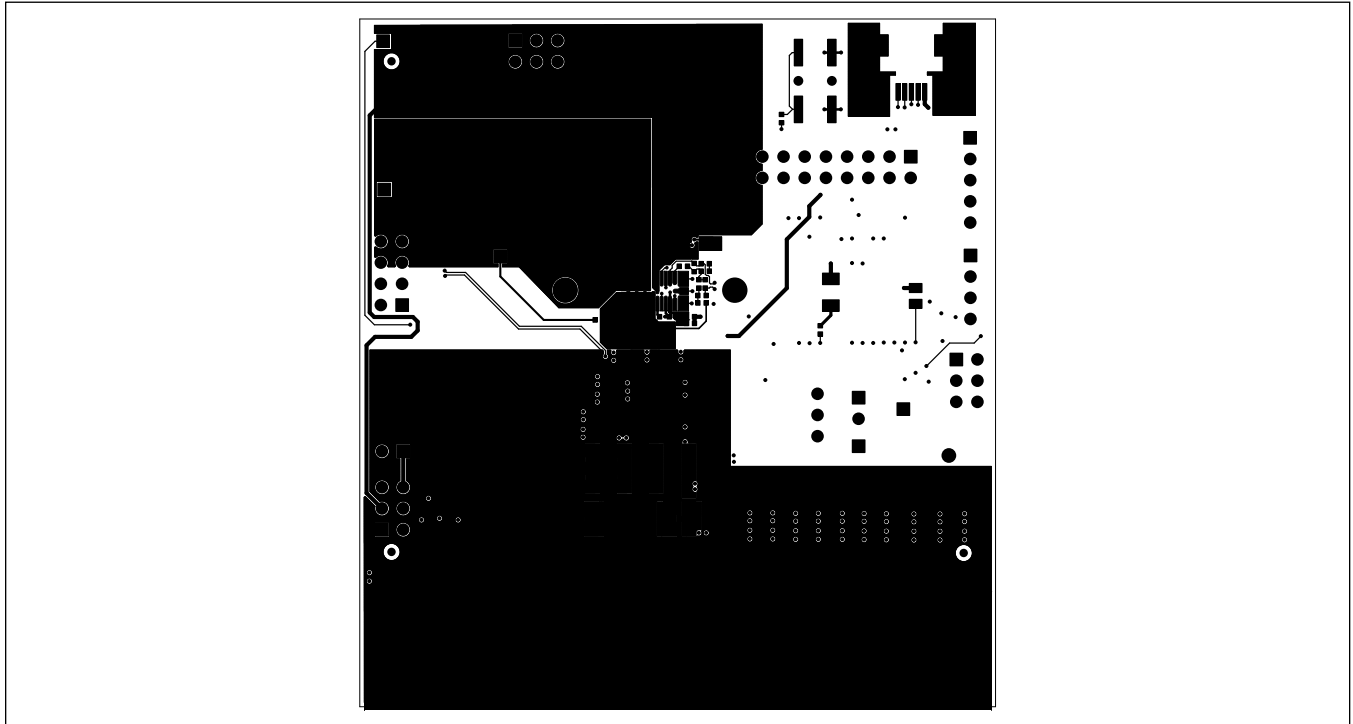


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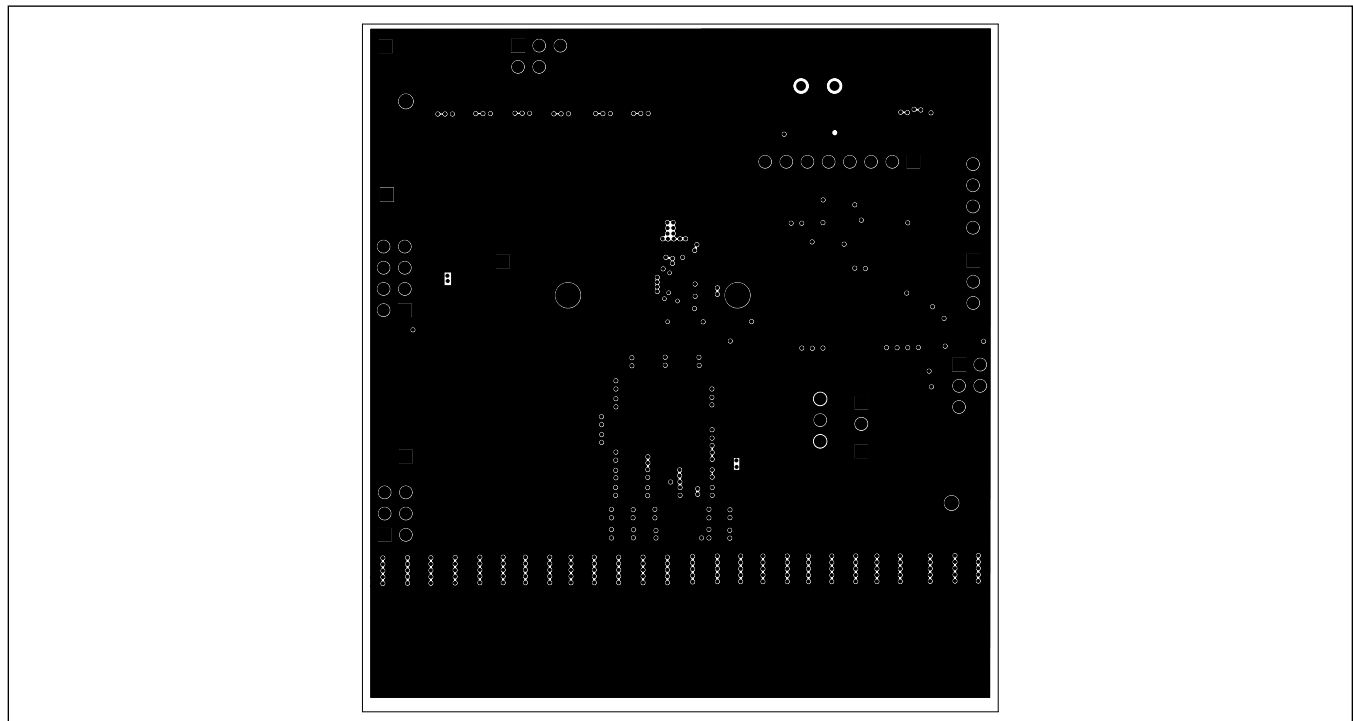
MAX20733 PCB Layout



MAX20733 PCB Layout (continued)

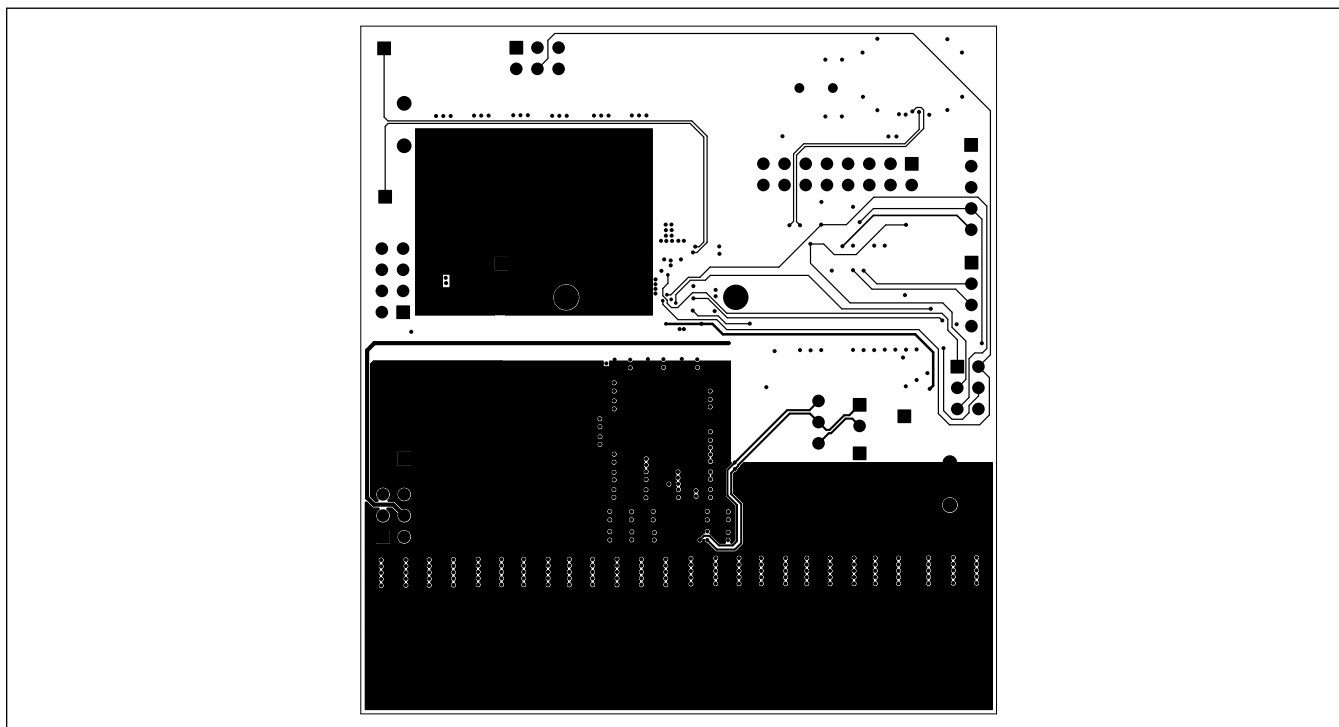


Layer 1

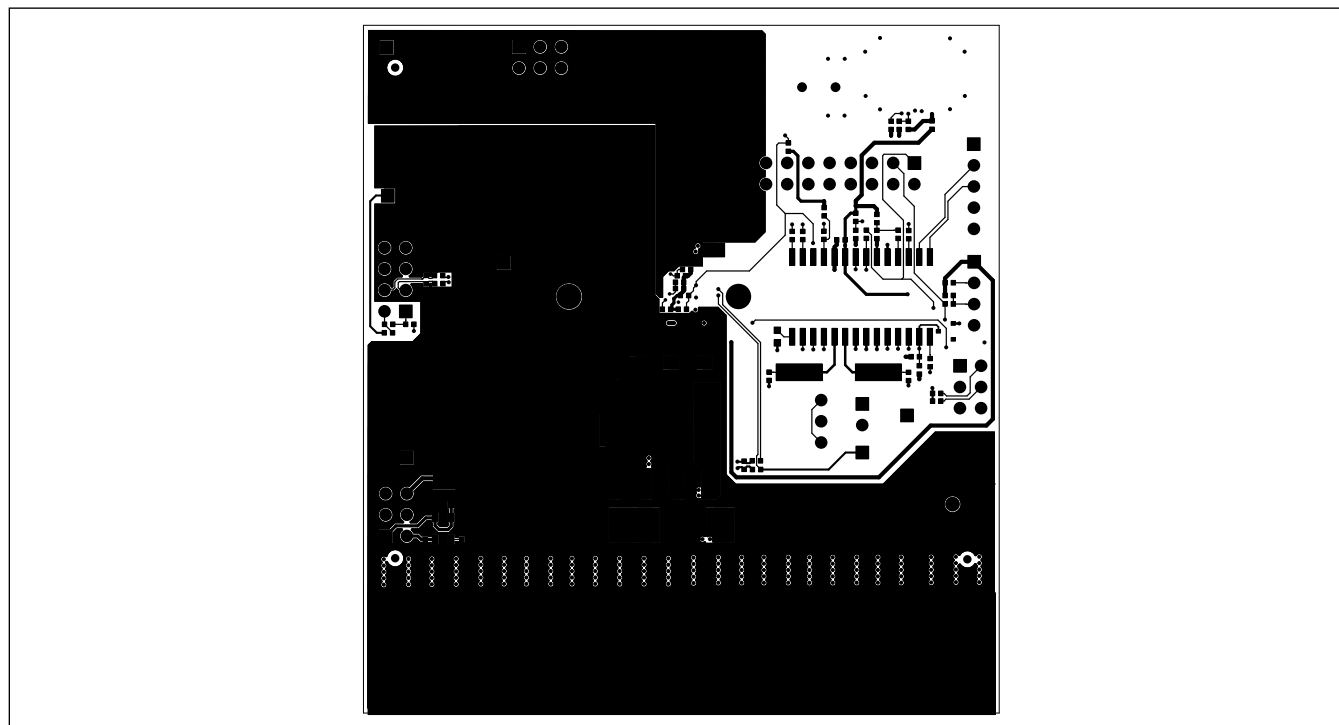


Layer 2

MAX20733 PCB Layout (continued)



Layer 3



Layer 4

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/16	Initial release	—

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